

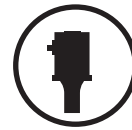
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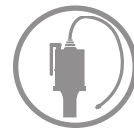
iQ Series

ULTRASONIC GENERATOR/POWER SUPPLY

Auto-Plus



AUTOMATED



HAND PROBE



PRESS

User's Manual



Dukane Part No. 403-591-00

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ISO 9001 Products are manufactured
in ISO registered facilities.



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This user's manual documents product features, hardware, and controls software available at the time this user's manual was published.

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Contents

Section 1- Introduction	1
Section 2- Health and Safety	7
Section 3- Installation	13
Connecting Cables	17
MPC Module Installation Guide	22
Section 4 - System Operation	25
<i>iQ</i> Auto-Plus System Operational Test	28
LED Indication	32
Section 5 - Options	33
Heat Sink	35
Computer Interface	36
Section 6 - Automation Interface	37
Input/Output Connection Examples	39
E-Stop Wiring and Automation System Safety Circuit	43
<i>iQ LinQ</i>	44
Section 7 - Contacting Dukane	47
Section 8 - Specifications	33
Generator Outline Drawing	53
Weight, Operating Environment	54
AC Power Requirements	55
Ultrasound Pressure	56
Interpreting the Model Number	57
<i>iQ</i> Auto to <i>iQ</i> Auto Plus Inputs /Outputs Comparison	58
Section 9 - Appendices	61
Index	65

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SECTION 1

Introduction

General User Information	3
Read The Manual First	3
Notes, Cautions and Warnings	3
Drawings and Tables	3
Generator Overview	4
Key Generator Features	4
Thermal Considerations	5

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General User Information

Read This Manual First

Before operating your ultrasonic system, read this User's Manual to become familiar with the equipment. This will ensure correct and safe operation. The manual is organized to allow you to learn how to safely operate this equipment. The examples given are chosen for their simplicity to illustrate basic operation concepts.

This manual provides information to set up, operate, and interface this generator/power supply.

Particular models are listed in **Section 7 - Specifications**.

Notes, Cautions and Warnings

Throughout this manual we use NOTES to provide information that is important for the successful application and understanding of the product. A NOTE block is shown to the right.

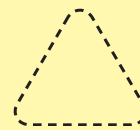
In addition, we use special notices to make you aware of safety considerations. These are the CAUTION and WARNING blocks as shown here. They represent increasing levels of important information. These statements help you to identify and avoid hazards and recognize the consequences. One of three different symbols also accompany the CAUTION and WARNING blocks to indicate whether the notice pertains to a condition or practice, an electrical safety issue or a operator protection issue.

Drawings and Tables

The figures and tables are identified by the section number followed by a sequence number. The sequence number begins with one in each section. The figures and tables are numbered separately. The figures use Arabic sequence numbers (e.g. -1, -2, -3) while the tables use Roman sequence numerals (e.g. -I, -II, -III). As an example, Figure 3-2 would be the second illustration in section three while Table 3-II would be the second table in section three.

NOTE

Note statements provide additional information or highlight procedures.



CAUTION

Caution statements identify conditions or practices that could result in damage to the equipment or other property.



WARNING

Warning statements point out conditions or practices that could result in personal injury or loss of life.



Condition
or Practice



Electrical
Safety Issue



Operator
Protection
(hearing)

Generator Overview

This generator is designed for ultrasonic applications controlled by a Programmable Logic Controller (PLC). Using the available system control inputs and outputs, the generator can easily be integrated into a wide variety of automated systems.

The generator design accepts several control input signals, provides system output signals, has a variety of status LED indicators, and built-in USB and EtherNet connectors.

The Multi-Probe Control (MPC) interface allows the generator to power multiple probes selected by an automated control system.

This product's rugged internal ultrasonic generator circuitry ensures a continuous resonant frequency lock at the start of each weld. Ultrasonic settings for the drive signal, phase delay angle, starting frequency and soft-start ramp parameters can be customized at the factory. (Contact your local Dukane sales representative for more information.) Users can modify generator performance to meet a wide variety of ultrasonic processing requirements if needed.

The generator's compact size allows multiple units to be placed into an industrial equipment cabinet, and the generator will operate at the same international line voltage input specifications as the other generators of this product family. It also includes an RFI line filter that passes strict CE test specifications for global applications.

Key Generator Features

- **Compact Enclosure Size** requires a small footprint for either vertical or horizontal mounting into your equipment cabinet.
- **Pulse Width Modulation** incorporates patented circuitry giving the power supply the ability to efficiently change the output amplitude. This makes it possible to start large horns with reduced power. It also provides more power efficient switch-mode generator operation and increased reliability.
- **Linear Ramp Soft Start** circuitry allows the acoustic stack to ramp up to operating amplitude smoothly, minimizing the startup surges and abnormal stress to the stack and generator.
- **Automatic Tuning** tracks the resonant frequency of the acoustic stack (horn, booster, transducer) and adjusts the generator output frequency to match it. This is done for every weld cycle and eliminates the need to manually tune the generator.

- **Line Voltage Regulation** automatically maintains constant amplitude regardless of line voltage deviation. The available output power is maintained with any voltage input within the specified range. This provides consistent system performance regardless of line voltage fluctuations. It also eliminates the need for bulky, external constant-voltage transformers.
- **Load Regulation** provides constant amplitude automatically regardless of power draw. The ultrasonic output amplitude level is held to within $\pm 1\%$ to provide weld process consistency and reduced weld cycle times.
- **Industrial Line-Power Source** means that standard systems will operate worldwide at all industrial high line voltage levels, whether it is 200VAC @60Hz in Japan, 240VAC @50Hz in Europe or 208VAC @60Hz in the United States. There are no internal transformer taps to change for worldwide operation.

NOTE

120VAC is also available for these countries: United States of America, Canada, Mexico and Japan.

- **Amplitude Adjustment Control** allows the peak-to-peak excursion of the horn at its workface to be adjusted between 20% and 100% of the horn's nominal amplitude.
- **Multiple Electronic Overload** protection circuits prevent instantaneous component failure in the event of extreme output overload conditions and rated overload power limit is based on the actual true RMS power output level.
- **CE Certification** means that the system meets the required European standards to be sold and used in Europe.
- **ISO 9001 Certification** means that this system has been manufactured to high quality standards and assures you of manufacturing excellence.
- **TUV Certification** - TÜV Rheinland certifies Dukane products comply with applicable UL (Underwriters Laboratories) and CSA (Canadian Standards Association) requirements.

Thermal Considerations

The thermal design of this generator is for applications that require 600 watts or less of power at less than a 50% duty cycle. For applications that require higher duty cycles, an optional cooling package is available. The cooling package includes a heat sink that mounts to the rear of the generator. See *Section 5 - Options*.

Figure 1-1 shows the thermal capability of the generator with and without the cooling package. For further information about the cooling package, contact your local Dukane sales representative.

NOTE

Add transducer cooling as necessary to keep front mass temperature to 100°F or less.

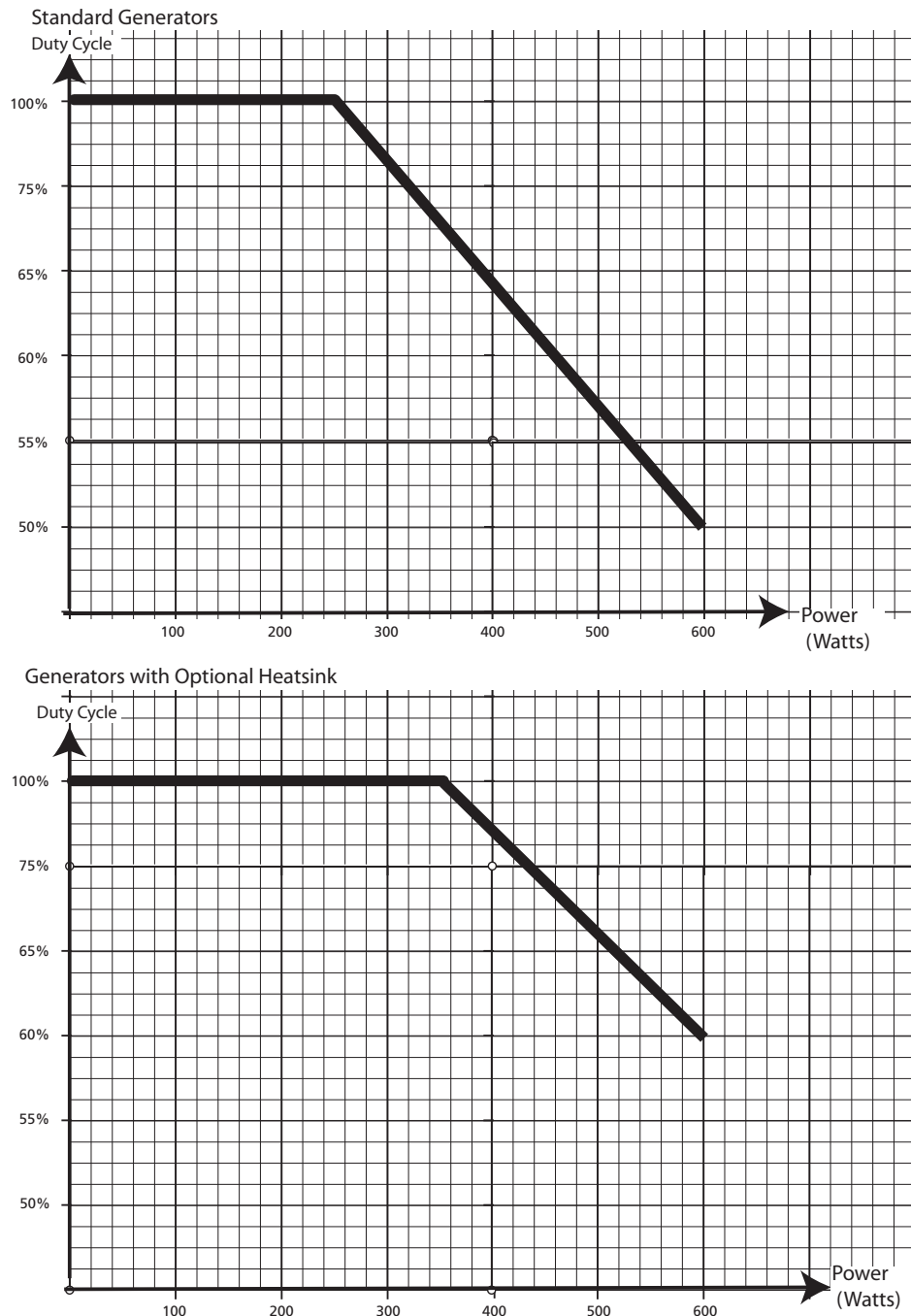


Figure 1-1 Thermal and Power Considerations for iQ Auto Generators

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SECTION 2

Health and Safety

General Considerations	9
Plastics Health Notice.	9
Electrical Safety	10
Power Grounding Connection	11

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General Considerations

Please observe these **health and safety recommendations** for safe, efficient, and injury-free operation of your equipment.

Proper Installation - Operate system components only after they are properly installed.

No Unauthorized Modifications - Do not modify your system in any way unless authorized to do so by Dukane Corporation. Unauthorized modifications could cause equipment damage and/or injury to the operator. In addition, unauthorized modifications will void equipment warranty.

Keep the Cover On - Do not remove any equipment cover unless directed to do so by Dukane Corporation. The generator produces hazardous electrical voltages which could cause injury.

Grounded Electrical Power - Operate this equipment only with a grounded electrical connection.

See *Electrical Safety* for grounding instructions, Page 9.

Comply with Regulations - You may be required to add accessories to bring the system into compliance with applicable regulations (OSHA in the USA) for machine guarding and noise exposure.

Use Eye Protection - Wear ANSI approved safety impact goggles.

Acoustic Stack Hazard - When an acoustic stack (transducer, booster, horn and tip) is energized by the ultrasound signal, it presents a potential hazard. Stay clear of an energized stack.

System E-STOP (abort) Switch - Install a system E-STOP (abort) switch at each operator station when ultrasonic plastic assembly equipment is used with automatic material handling equipment in an automated system.

Foot Switch - Do not use a foot switch. Using a foot switch in place of the optical touch finger switches (operate switches) violates OSHA regulations. Do not install a foot switch.

NOTE

These recommendations apply to the welding system. System in this manual refers to a complete group of components associated with the welding of parts, also known as an ultrasonic assembly system. A typical *iQ Series* System consists of the iQ generator, a press with thruster, switches, controls, cables, transducer, booster, horn, and fixture, and *iQ Explorer II* software.

WARNING



Any fixture manufactured by a third party must comply with all OSHA and ANSI requirements. All fixtures must be guarded as necessary. Dukane Corporation does not assume any responsibility or liability for fixtures manufactured by the customer or any third party manufacturer.

WARNING



Never operate the generator with the cover off. This is an unsafe practice and may cause injury.

CAUTION



At some time you may be asked to remove equipment covers by the Dukane Service Dept. personnel. Before doing so, disconnect the unit electrically from the incoming line AC power. If the unit is a press/thruster, lock the Air Lockout Valve, located on the rear panel, in its closed position.

Continued

General Considerations

System Electrical Cabling - Electrical power must be off when connecting or disconnecting electrical cables.

Do Not Wear Loose Clothing or Jewelry - They can become caught in moving parts.

Stay Alert - Watch what you are doing at all times. Use common sense. Do not operate the press when you are tired or distracted from the job at hand.

Do Not Operate the Equipment - Your judgement or reflexes could be impaired while taking prescription medications. If so, do not operate the equipment. Be familiar with warning labels and recommended activity restrictions that accompany your prescription medications. If you have any doubt, do not operate the equipment.

Plastics Health Notice

Certain plastic materials, when being processed, may emit fumes and/or gases that may be hazardous to the operator's health. Proper ventilation of the work station should be provided where such materials are processed. Inquiries should be made to the U.S. Department of Labor concerning OSHA regulations for a particular plastic prior to processing with Dukane ultrasonic equipment.

Electrical Safety

The *iQ Series* generator provides the operating power and power returns. Make sure the generator is grounded properly.

In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). Every generator contains a RFI filter which blocks noise on the AC power line from entering the generator control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line.

If you experience problems with RFI from the press, run an additional grounding wire from the press base grounding stud to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp. Use at least 14 AWG wire for the connection to the press base.

CAUTION



Parts being joined ultrasonically will at times vibrate at audible frequencies. Wear ear protectors to reduce annoying or uncomfortable sounds. In addition, ultrasound baffles, sound enclosures, or materials that absorb sound may be located to surround the system. Ultrasound pressure level could exceed 110dB. See Ultrasonic Pressure, Table 8-II, Page 56.

WARNING



Keep head, hands, limbs and body at least six inches (152 mm) away from an operating press/thruster. A vibrating, descending horn can cause burns and/or crushing injuries.

CAUTION



When making cable connections to system equipment or disconnecting cables from system equipment, make sure electrical power to the system is turned off, and AC power cords are removed from their receptacles. After the cables have been securely connected and the connections and cable routing checked a final time, the power may be restored.

Electrical Safety

Power Grounding Connection

Figure 2-1 illustrates how the AC line is connected to the *iQ* Auto Plus generator.

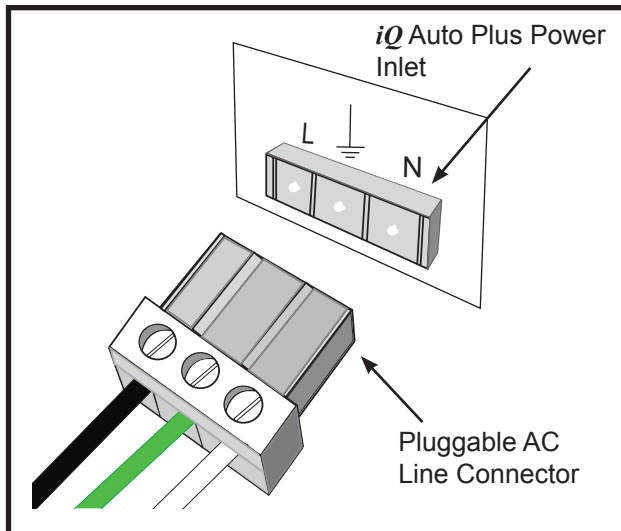


Figure 2-1 AC Line Connection


Terminal	Wire Color	
	North America	Europe
L (Live)	Black	Lt. Brown
 (Ground)	Green	Green w/yellow stripe
N (Neutral)	White	Lt. Blue

Table 2-1 Conventional Wire Color Code

CAUTION



If there is any question about grounding of your equipment and/or its electrical power source, contact a qualified electrician.

CAUTION



For safe system operation: To avoid the risk of fire, electrical shock, serious injury or death, the power line safety ground must be securely connected to the center terminal on the (pluggable) AC line connector.

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SECTION 3

Installation

Unpacking	15
Placement	15
Power Grounding	16
Chassis Grounding Stud.	16
Connecting Cables	17
Basic Connections.	17
P1 System I/O Connector Pinout.	18
Multi-Probe Control (MPC)	20
MPC Module Installation Guide	22
MPC Module Status LEDs.	24

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Unpacking

Carefully open your shipping container, and make sure it contains the items shown on the shipping documents. Inspect all items, and report any missing items or damage immediately.

Placement

Make certain generator placement and cable routing do not interfere with normal operation. Maintain easy access to your equipment.

The operator should have unobstructed access to cables and wiring.

Two sets of removable mounting brackets are attached to the generator. See Figure 3-1, below. Use them to securely mount the unit vertically or horizontally in your equipment cabinet.

If the generator is installed inside an enclosure with a door, be sure there is adequate clearance for the system cables with the door closed.

NOTE

For equipment weights see Page 54, in **Section 8, Specifications**.

NOTE

Heat Dissipation - Provide enough air flow for heat dissipation. For best heat dissipation, mount the generator vertically.

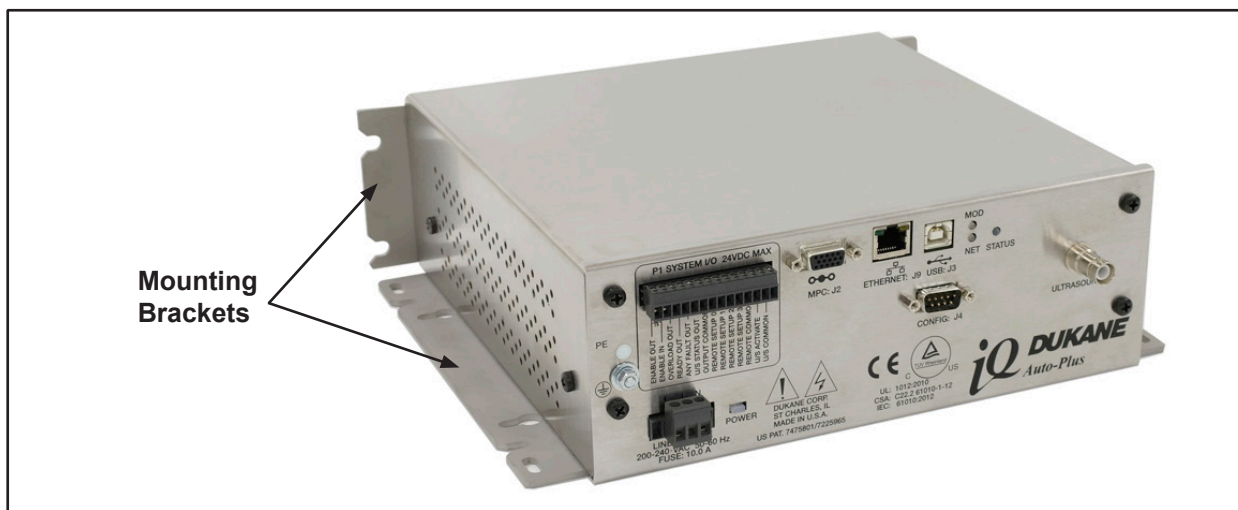


Figure 3-1 Mounting Brackets - Rear and Bottom

Placement in a Seismic Region

If the **iQ** generator is to be used in an active seismic region, secure the unit by rack-mounting it or by securing the unit to a benchtop.

Refer to Dukane's website for more information about installation in a seismic zone. See Application Note 511 - http://www.dukane.com/us/DL_ApplData.asp

Power Grounding

For safety, the **iQ** Auto chassis must be properly grounded. The power line ground connection is located on the center screw terminal on the AC Power Inlet pluggable screw terminal connector.

This system ground connection must be attached to an earth ground potential at the electrical box that supplies power to the enclosure or cabinet in which the **iQ** Auto system is installed.

The ground connection should comply with all of the requirements specified by the National Electrical code and any other local codes or ordinances that are applicable.

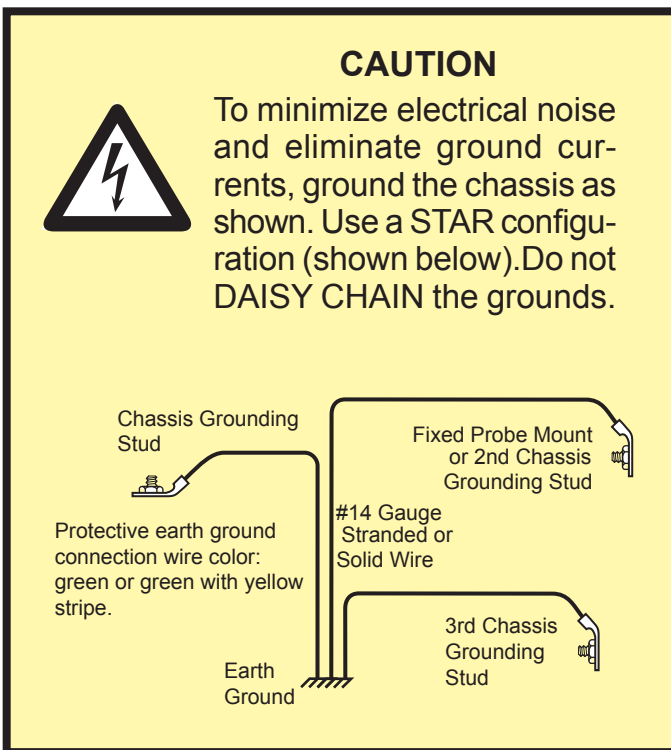
Chassis Grounding Stud

Proper grounding for the generator chassis is essential for the effective suppression of electrical noise or RFI (Radio Frequency Interference). Every ultrasonic generator contains a RFI filter that blocks noise on the AC power line from entering the system control circuitry. This filter also prevents ultrasonic frequency noise from being fed back into the AC power line. For the RFI filter to operate effectively, it is necessary to correctly ground the system. The power line ground previously mentioned is mandatory.

Additionally, the included grounding wire must be connected from the grounding stud connection (see Figure 3-1) to the nearest grounded metal pipe or equivalent earth ground.

This will improve the chassis ground connection and may be needed in noisy industrial environments.

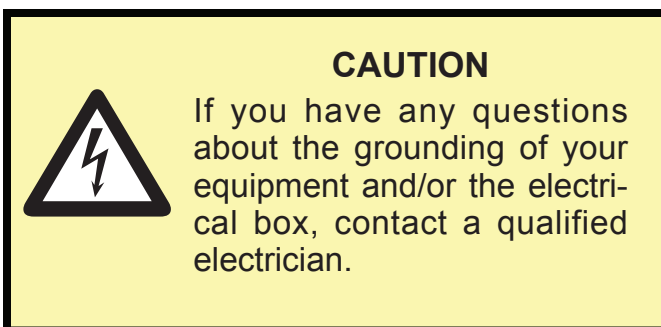
See *Connecting Cables* on the next page.



NOTE

Chassis Grounding Stud

The chassis grounding stud is used to attach a protective earth ground to the generator. This helps suppress electrical interference or radio frequency interference (RFI) that is common in an industrial environment. Stud location is shown in Figure 3-2 on the following page.



Connecting Cables

Basic Connections

Complete these basic connections for the standard configuration as shown below:

- AC Line Input
- System Control Inputs/Status Outputs
- Ultrasound Output
- Grounding

Details about the various system connectors and their pin assignments are covered in the next section.

1. Wire the AC line connector, and attach it to the generator's power inlet connector, matching the power source line, ground, and neutral with the generator's line, ground, and neutral connector pins - **A** in Figure 3-4. (See Figure 2-1 also.)
2. Wire the user-supplied automation system control inputs/status outputs to the P1 SYSTEM I/O connector, and attach it to the P1 SYSTEM I/O port - **B** in Figure 3-4.
3. Attach a high-voltage coaxial ultrasound cable (from the ultrasonic probe) to J1, the ultrasound output connector - **C** in Figure 3-2.
4. Connect the included ground wire from the grounding stud, **D** in Figure 3-4, to earth ground.

NOTE

Connecting Cables

Two-piece pluggable terminal block connectors are used for the System I/O connections and the AC Power Inlet connections.

This type of connector allows the wiring to be attached to the screw terminal connector, which plugs into the mating connector on the *iQ* Auto system front panel.

In the event a field replacement unit is required, the screw terminal connectors with the wires can be easily detached and then plugged into the replacement unit.

NOTE

AC Power Inlet

Line voltage required for the generator is 200-240 VAC at 50/60 Hertz and 6.3 Amps, or 100-120VAC at 50/60 Hz and 15 Amps. The unit does not include a power switch, and is powered ON whenever the AC line power is live.

The unit can be switched ON/OFF with a user-supplied AC circuit breaker wired to the AC power inlet connection.

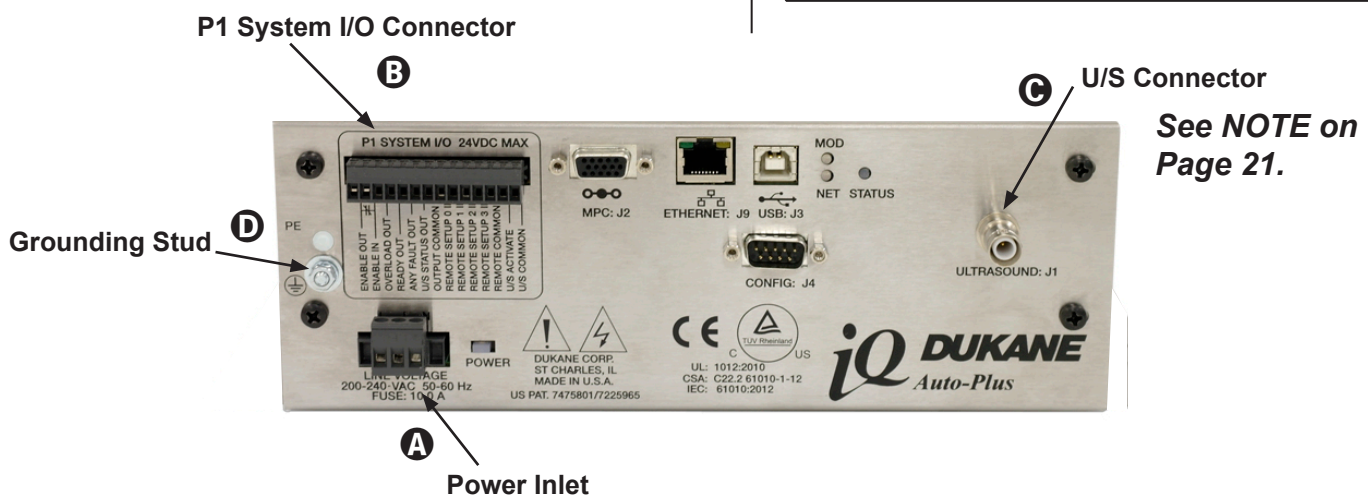


Figure 3-2 Generator Front View

P1 System I/O Connector Pinout

The P1 SYSTEM I/O connector is a two-piece pluggable terminal block connector.

Table 3-I lists the signal names and descriptions, with more detailed descriptions listed below and on the next page.

Pin	Signal Name
1	Enable Out (+22V Current Limited)
2	Enable In (Jumper to Pin 1, without an E-Stop switch)
3	Overload Out (System overload status output)
4	Ready Out
5	Any Fault Out
6	U/S Status Out
7	Output Common (Isolated)
8	Remote Setup 0 Input
9	Remote Setup 1 Input
10	Remote Setup 2 Input
11	Remote Setup 3 Input
12	Remote Common (Isolated)
13	U/S Activate
14	U/S Common (Isolated)

Table 3-I P1 System I/O Connector Signals

Pin 1 (Enable Out)

This is a current limited voltage source output intended to connect to an E-Stop circuit. If an E-STOP circuit is not used, Pin 1 must be jumpered to Pin 2 for ultrasound operation to be enabled.

Pin 2 (Enable In)

The output from the E-STOP circuit is connected to this pin when an E-STOP circuit is used. Otherwise, this pin must be jumpered to Pin 1 for ultrasound operation to be enabled. See Figure 6-5 for E-STOP circuit wiring examples.

Pin 3 (Overload Out)

Pin 3 is an isolated digital NPN/PNP status output that activates when an output overload condition is tripped. This output will be an open circuit if an output overload condition is not tripped. This output will remain latched ON until the U/S Activate input is switched OFF and then ON again.

Pin 4 (Ready Out)

Pin 4 is an isolated digital NPN/PNP status output signal. The signal will activate when the system is ready to begin a weld cycle. This output will be an open circuit when the welding process controller determines that the next welding cycle cannot be started. This will occur if the system is in cycle, a system fault is active, or the system is off line, but not as a result of a process fault like Overload. When an MPC module is connected, this output will also be an open circuit when the MPC system is not ready to accept changes to control input signals.

Any changes to the Remote Selection inputs will be ignored until this status output signal activates to the ready state. This status output signal will also be open if a fault condition is detected inside the MPC system. If this status output will not activate when using an MPC module, check for a RED fault status indication (SYSTEM STATUS LED) on the front panel of the MPC module.

Pin 5 (Any Fault Out)

Pin 5 is an isolated digital NPN/PNP status output that activates whenever any fault condition is detected that inhibits ultrasound output and normal system operation. This output will be an open circuit when no system fault conditions are active.

Pin 6 (U/S Status Out)

Pin 6 is a digital NPN/PNP status output that activates when the system is delivering ultrasonic power to the load attached to the ultrasound output connector. This output will be an open circuit when the ultrasound output is off.

Pin 7 (Output Common)

Pin 7 is electrically isolated from chassis ground. This common line should be connected to the negative output of a user-provided isolated 24VDC power supply for a PLC sourcing input card. For a PLC Sinking input card this line is connected to the positive output of the isolated 24VDC power supply.

Pin 8 (Remote Setup 0 Input)

Pin 8 represents Setup Bit 0. This is the least significant bit used to select different probe channels when a Multi-Probe Control (MPC) Interface is used. This MPC control bit is used on all MPC systems.

Pin 9 (Remote Setup 1 Input)

Pin 9 represents Setup Bit 1. This is the second least significant bit used to select different probe channels when a MPC Interface is used. This MPC control bit is used on MPC systems with three or more channels.

Pin 10 (Remote Setup 2 Input)

Pin 10 represents Setup Bit 2. This is the third least significant bit used to select different probe channels when a MPC Interface is used. This MPC control bit is used on MPC systems with five or more channels.

Pin 11 (Remote Setup 3 Input)

Pin 11 represents Setup Bit 3. This is the second most significant bit used to select different probe channels when a MPC Interface is used. This MPC control bit is used on MPC systems with nine or more channels.

Pin 12 (Remote Common)

Pin 12 is electrically isolated from chassis ground. Using sourcing (PNP) output drivers, this common line would be connected to the automation system ground potential. Using sinking (NPN) output drivers, this common line would be connected to the automation system positive supply voltage output. Refer to *Section 6* for wiring examples to connect input signals.

Pin 13 (U/S Activate)

Pin 13 is used to activate the generator ultrasound output. Activation of this control input will switch the ultrasound output ON, and deactivating this signal will switch ultrasound OFF. This input signal will also function as a cycle start input, where the ultrasound activation and timing are completely under the control of the process controller. Depending on the welding process controller setup, this input signal could be activated momentarily to start a welding cycle.

Pin 14 (U/S Common)

Pin 14 is electrically isolated from chassis ground. Using sourcing (PNP) output drivers, this common line would be connected to the automation system ground potential. Using sinking (NPN) output drivers, this common line would be connected to the automation system positive supply voltage output. Refer to *Section 6* for wiring examples to connect input signals.

Multi-Probe Control (MPC)

The *iQ* Auto-Plus includes an MPC Interface that powers and controls an external MPC multi-probe control module.

This external module, (that can be ordered with a minimum of two probe controls up to a maximum of 16 probe controls), must be purchased in addition to the *iQ* Auto-Plus generator for a fully functional MPC system.

The connections needed for the MPC Interface board are described below. Connections required for the external MPC module are also described below.

Optional MPC Interface Connections

Complete the same basic connections used for the standard *iQ* Auto-Plus configuration as previously described on Page 19.

- AC Line Input
- System Control Inputs/Status Outputs
- Ultrasound Output
- Grounding (optional)

In addition to completing Steps 1-4 of the basic connections as previously described, complete Steps 5 and 6 to wire the MPC Control Inputs/Status Outputs as described below.

5. **P1 SYSTEM I/O Connector** - Wire the MPC control/input signals REMOTE SETUP 0-REMOTE SETUP 3 terminal block to the user-supplied automation control system - **B** in Figure 3-3.

6. **MPC INTERFACE** - Attach one end of the MPC Interface cable (Dukane # 200-1408-XX) to the MPC: J2 connector on the *iQ* Auto-Plus panel - **E** in Figure 3-3.

Connect the other end of the cable to the MPC INTERFACE connector on the right rear of the MPC module. See Figure 3-5.

NOTE

The MPC Interface cable is a separate line item on the *iQ* Auto-Plus system order. The -XX at the end of the cable number specifies cable length. This will vary depending on your MPC installation.

P1 System I/O Connector

MPC Interface Connector

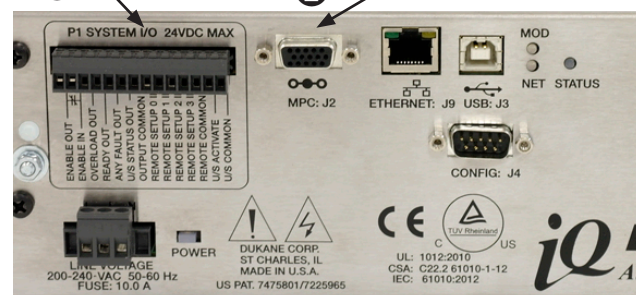


Figure 3-3 MPC Interface Connector

MPC Probe Control

When the optional MPC Interface and MPC I/O (REMOTE SETUP 0-3) on the system I/O connector are used, the generator has the capability of controlling as many as sixteen compatible probes. One probe can be turned on at a time while the sequence of probe activation is determined by the user's automation.

The table below shows how the setup bit inputs correspond to the probes.

System I/O Remote Setup Inputs				Probe Selected
3	2	1	0	
Off	Off	Off	Off	1
Off	Off	Off	On	2
Off	Off	On	Off	3
Off	Off	On	On	4
Off	On	Off	Off	5
Off	On	Off	On	6
Off	On	On	Off	7
Off	On	On	On	8
On	Off	Off	Off	9
On	Off	Off	On	10
On	Off	On	Off	11
On	Off	On	On	12
On	On	Off	Off	13
On	On	Off	On	14
On	On	On	Off	15
On	On	On	On	16

Table 3-II System I/O Remote Setup Inputs

NOTE

Ultrasound Output Connector

The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism.

The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage (1200VAC). At high power levels this can exceed 2 amps of current and must be securely terminated via the ultrasound cable for safe operation. Use original equipment ultrasound cables for safe and reliable system operation. Improperly assembled ultrasound cables can result in high voltage arcing and will destroy the ultrasound connectors.

MPC Module Installation Guide

MPC modules are designed for assembly systems where one ultrasonic generator is sequenced to as many as 16 ultrasonic probes.

The MPC module is typically supplied as a stand-alone bench-top unit, or as a component that can be mounted in a through-panel configuration.

No special installation is needed for a stand-alone MPC module that can be put on a bench top or a shelf.

Use the following installation recommendations for a panel mounted MPC module.

Cut Outs

For panel mounted modules:

Use Figure 3-4 below to determine the size of the cut needed for your equipment panel.

Make the appropriate cut, and install the MPC module securing the mounting flange to the equipment panel before continuing with the cable connections.

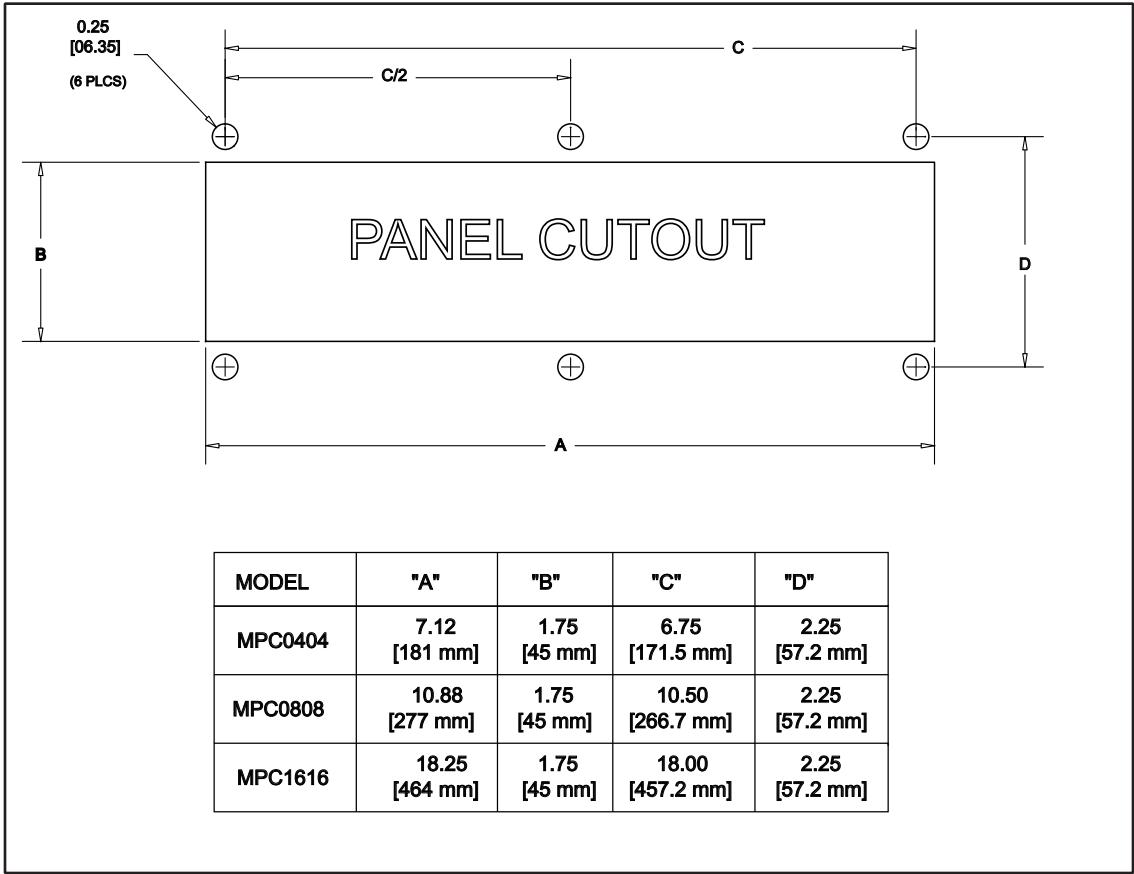


Figure 3-4 MPC Module Cutout Guide

Connecting Cables

For stand-alone modules and securely installed panel mounted modules:

Rear Connections

Refer to Figure 3-5 below. Complete these connections.

1. Earth ground - Connect one end of a user-supplied 14-Gauge ground wire to the ground connection at the rear of the MPC - **A** in Figure 3-5. Connect the other end of the wire to an earth ground potential at the electrical box that supplies power to the equipment (or to the equipment enclosure into which your system is installed).
2. U/S (ultrasonic) cable (Dukane P/N 200-479-XX - Order the correct cable length for your installation.) - Connect one end of the cable to the left rear U/S connector of the MPC module- **B** in Figure 3-5. The other end of the cable connects to J1 of the ultrasonic generator.
3. MPC Interface cable (Dukane P/N 200-1408-XX - Order the correct cable length for your installation.) - Connect one end of the cable to the right rear MPC Interface connector- **C** in Figure 3-5. The other end of the cable connects to the MPC INTERFACE connector on the ultrasonic generator.

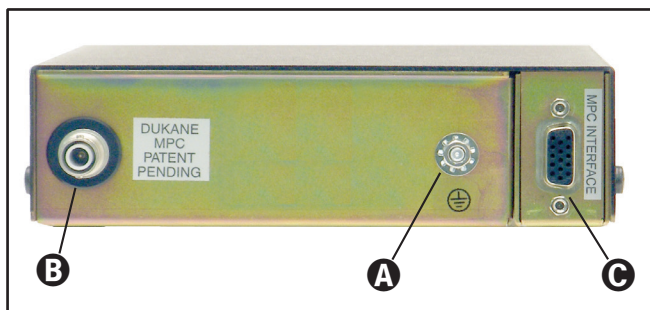


Figure 3-5 MPC Module Rear Connectors

Front Connections

Refer to Figure 3-6 below. Complete these connections.

1. Probe Cable(s) - Beginning with **PROBE 1**, connect one end of the cable (See Table 3-III below.) to the U/S connector on the MPC's front panel - **D** in Figure 3-6. Connect the other end of the cable to the corresponding probe for your specific welding application.
2. Repeat Step 1 for each of the remaining probes (in sequence: 2, 3, 4, etc.) in your system.

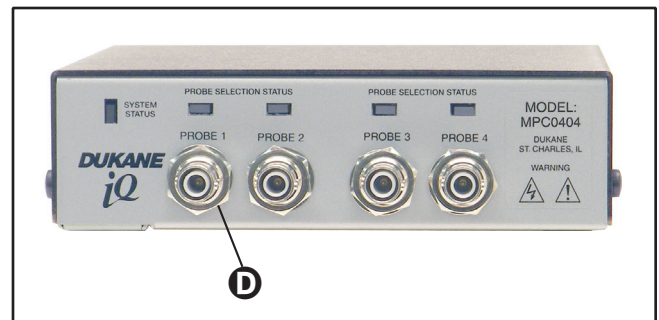


Figure 3-6 MPC Module Front Connectors

System Frequency	Probe P/N	Cable P/N : MPC to Probe
20kHz	41Q20RE or 41Q20RS	200-479-XXM
30kHz	41A60E or 41A60S	200-479-XXM
40kHz	41A40	200-615-XXM

Table 3-III Probe Cables

XX = length in meters

MPC Module Status LEDs

System Status

The front panel SYSTEM STATUS LED lights up GREEN when the system is powered and ready - **E** in Figure 3-7.

If this LED is lit with a YELLOW/ORANGE color, a recoverable fault condition has tripped. This indicates that the system is operational, but a fault condition has occurred preventing normal operation. Examples of this type of fault would be a generator overload that will automatically reset when the next weld cycle begins, or the automation control system is selecting a channel that doesn't exist - trying to select channel 10 for an 8 channel system, for instance.

If this LED lights up RED, a hardware fault has been sensed, and the unit should be returned to Dukane for servicing.

Probe Selection Status

The PROBE SELECTION STATUS LED - **F** in Figure 3-7 - lights up GREEN indicating it is the selected probe.

A probe's LED turns to RED (from GREEN) when ultrasonic power is activated.

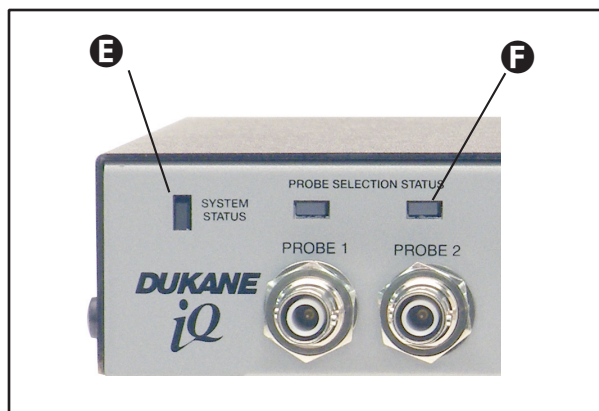


Figure 3-7 MPC Module Status LED's

NOTE

Refer to **Section 4, System Operation**, for more information.

SECTION 4

System Operation

Introduction.	27
<i>iQ</i> Auto-Plus System Operational Test	28
<i>iQ</i> Auto-Plus System with MPC Module Operational Test . . .	29
LED Indication	31

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Introduction

The ultrasonic *iQ* Auto-Plus generator/power supply, is specifically designed to meet the machine builder's requirements. This unit is automation ready and may be used as a stand-alone generator, or with it's integrated Multi-Point Controller (MPC) Interface. The MPC interface, when connected to the Dukane MPC module, allows one generator to control multiple probes.

The generator's USB and EtherNet ports extend communication and control functions depending on the specifications of a particular generator model.

This section deals primarily with basic operational testing and troubleshooting.

iQ Auto-Plus System Operational Test

1. Verify that the standard system installation is complete and all cables are connected. If using an MPC module verify that the MPC installation is also complete.

Refer to installation instructions included in Section 3, if needed.

Refer to **Section 6 - Automation Interface** -for information on wiring system controls, if needed.

2. After completing Step 1, activate line power to the iQ Auto-Plus system.

Normal Condition:

GREEN - The POWER and STATUS LEDs on the iQ Auto-Plus panel should both light up GREEN.

The system is now ready to operate.

Troubleshooting Abnormal iQ Auto-Plus System Conditions

POWER LED

RED - If this LED lights up RED, check line voltage level.

GRAY - If this LED is a gray color (not lit), check line input.

Optional System Status Output to Monitor:

Optionally the Any Fault Status Out status output can be monitored on system I/O connector Pin 5.

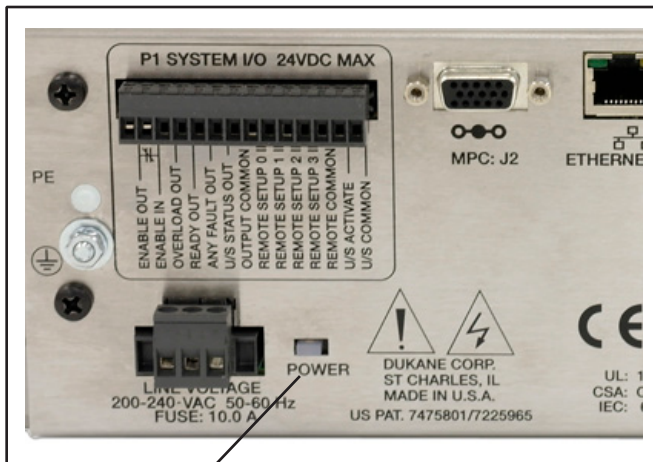
This status output signal will activate when power is not OK.

Optionally the READY output can be monitored. This status output signal will activate when the generator is ready to operate.

3. After completing Step 2, test ultrasound output by activating system I/O connector Pin 13.

Normal Condition:

The system is operating properly when power is delivered to the attached stack.



POWER LED

Figure 4-1 Generator POWER LED Detail

Ultrasound Activation Connections:

Usually an automated control system is wired to this control input.

Optionally - A manual switch could be wired to this control input.

Options for U/S Activation Connections:

Optionally, monitor the U/S Activate status output on system I/O connector Pin 13.

This status output signal will activate when U/S is ON.

4. Other Options the Operator can Check:

- **Fault Status** output signals

Fault Status output signals are available for:

Overload (Pin 3), or

Any Fault (Pin 5).

These status outputs will activate when there is a fault:

Continued

Continued from Previous Page

An **Overload Fault** latches until the next time U/S is activated.

Any Fault status activates when any fault is detected by the system. It latches until the start of the next cycle, unless it is activated due to Overtemperature or Power Not OK fault.

Five fault conditions are monitored by the **iQ** Auto-Plus system for Any Fault:

- **Average Overload**

(Automatically resets on next cycle, or until an activation of Fault Reset Input)

- **Peak Overload**

(Resets same as Average Overload)

- **Overtemperature**

(Automatically resets on cool-down)

- **Power Not OK**

(AC line voltage under minimum voltage)

- **Frequency Overload**

(Automatically resets on next cycle, or until an activation of Fault Reset Input)

iQ Auto-Plus System with MPC Module Operational Test

1. Verify that the system installation (with the MPC option) is completed and all cables are connected.

Refer to the **iQ** Auto-Plus installation instructions in Section 3, if needed.

Refer to **Section 6 - Automation Interface** - for information on wiring system controls, if needed.

2. After completing Step 1, activate line power to the standard **iQ** Auto-Plus system.

Normal Condition:

The **POWER LED** on the **iQ** Auto-Plus front panel should light up **GREEN**.

The **STATUS LED** on the **iQ** Auto-Plus front panel should light up **GREEN**.

The MPC module **SYSTEM STATUS LED** should light up **GREEN**.

The system is ready to operate when all status LEDs light up **GREEN**.

Troubleshooting Abnormal iQ Auto-Plus System Conditions

POWER LED

RED - If this LED lights up **RED**, check line voltage level.

GRAY - If this LED is a gray color (not lit), check line input.

STATUS LED

Not Green - If the status LED is not **GREEN**, refer to Table 4-I for more information.

Troubleshooting Abnormal MPC Module Conditions

MPC Module **SYSTEM STATUS LED** is **ORANGE/YELLOW** (resettable fault):

- Check for an **iQ** Auto-Plus overload on the previous welding cycle.
- Check for an invalid channel selection input control code - selection code is greater than the number of installed channels.

MPC **SYSTEM STATUS LED** is **RED** (non-recoverable fault).

Check for **POWER OK** fault on the **iQ** Auto-Plus System.

- Resolve any **iQ** Auto-Plus power problem first.
 - There could be a circuit failure in the MPC module. *If a circuit failure is discovered, return the MPC Module to Dukane for service.*
3. After completing Step 2, test ultrasound output by activating system I/O Connector Pin 13.

Normal Condition:

The system is operating properly when power is delivered to the attached stack.

Ultrasound Activation Connections:

Usually an automated control system is wired to this control input.

Optionally - A manual switch could be wired to this control input.

Continued

Options for U/S Activation Connections:

- Optionally monitor the U/S Active status output on I/O connector Pin 4.

This status output signal will activate when U/S is ON.

- Optionally monitor the Ready status output on system I/O connector Pin 4.

This status output signal will activate when the system, including the MPC module is ready.

4. Other options the operator can check:

- **Fault Status** output signals

Fault Status output signals are available for Overload (Pin 3) or Any Fault (Pin 5).

These status outputs will activate when a fault occurs:

An **Overload Fault** latches until the next time U/S is activated.

Any Fault status activates when any fault is detected by the system. The output will latch until U/S is activated unless the fault is Overtemperature or Power Not OK.

Five fault conditions are monitored by the *iQ* Auto-Plus system for Any Fault:

- **Average Overload**

(Automatically resets on next cycle, or until an activation of Fault Reset Input)

- **Peak Overload**

(Resets same as Average Overload)

- **Overtemperature**

(Automatically resets on cool-down)

- **Power Not OK**

(AC line voltage under minimum voltage)

- **Frequency Overload**

(Automatically resets on next cycle, or until an activation of Fault Reset Input)

5. Check MPC Channels

Check that all MPC channels can be selected and activated. The automation control system activates input selection bits.

Select a channel: PROBE SELECTION STATUS indicator illuminates GREEN when it is the selected channel.

Activate ultrasound: Activate the *iQ* Auto-Plus ultrasound output on I/O connector Pin 12. The PROBE SELECTION STATUS indicator on the selected channel should switch to RED (from GREEN).

The probe on the selected channel should deliver ultrasonic power.

Repeat this test for all MPC channels.

LED Indication

There are six LEDs on the *iQ* Auto-Plus generator:

- POWER (1)
- ETHERNET (2)
- MOD (1)
- NET (1)
- STATUS (1)

Figure 4-2 shows LED location, and Table 4-I shows their indications.

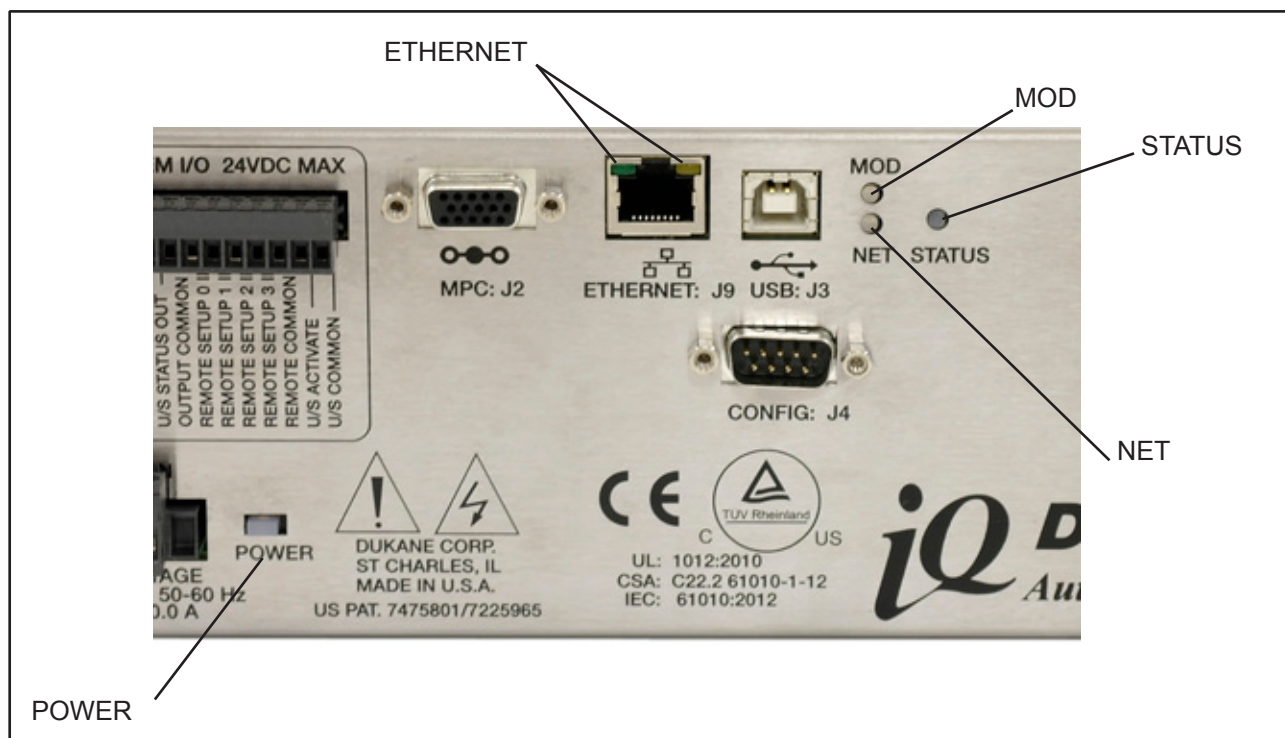


Figure 4-2 LED Locations

LED	COLOR	INDICATION
POWER	Gray	Off - No power.
	Green - Steady	Power on.
	Red - Steady	Voltage problem. Check line voltage level.
ETHERNET		
Left - Speed Indicator	Amber - Steady	On - Operating as a Gigabit connection (1000 Mbps)
	Green - Steady	On - Operating as a 100-Mbps connection.
	Off	Operating as a 10-Mbps connection.
Right - Activity Indicator	Yellow - Blinking	There is activity.
	Off	No activity.
MOD	Red - Steady	Unrecoverable Fault
	Red - Blinking	Minor Fault
	Green - Steady	Device Operational
	Green - Blinking	Standby
	Gray	Off - No power.
NET	Red - Steady	Duplicate IP (Not Supported)
	Red - Blinking	Connection Time Out
	Green - Steady	Connection
	Green - Blinking	No Connection
STATUS	Green - Steady	Ready
	Yellow - Steady	E-STOP Active
	Orange - Steady	In Cycle
	Red - Steady	Average Overload
	Red - Blinking	Peak Overload
	Blue - Steady	PLL Lock Fail
	Blue - Blinking	PLL Lock Lost
	Yellow - Blinking	Power Fault

Table 4-I LED Colors and Indication

SECTION 5

Options

Heat Sink	35
Computer Interface.	36

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Heat Sink

As mentioned in *Section 1 - Introduction*, the thermal design of this generator is for applications that require a power of 600 watts or less at duty cycles less than 50%.

For applications that require higher duty cycles, an optional cooling package is available. The Dukane Part Number for the package is 438-1020.

The cooling package includes a heat sink that mounts to the generator as shown in Figure 5-1 below.

When operating an iQ Auto-Plus generator with the optional heat sink, do so with the generator in the vertical position as shown in Figure 5-1. Air flow is enhanced, and the heat sink's efficiency is maximized.

CAUTION



Operate the iQ Auto-Plus generator in the vertical position as shown in Figure 5-1. This allows for optimal air circulation enabling the heat sink to be most effective.

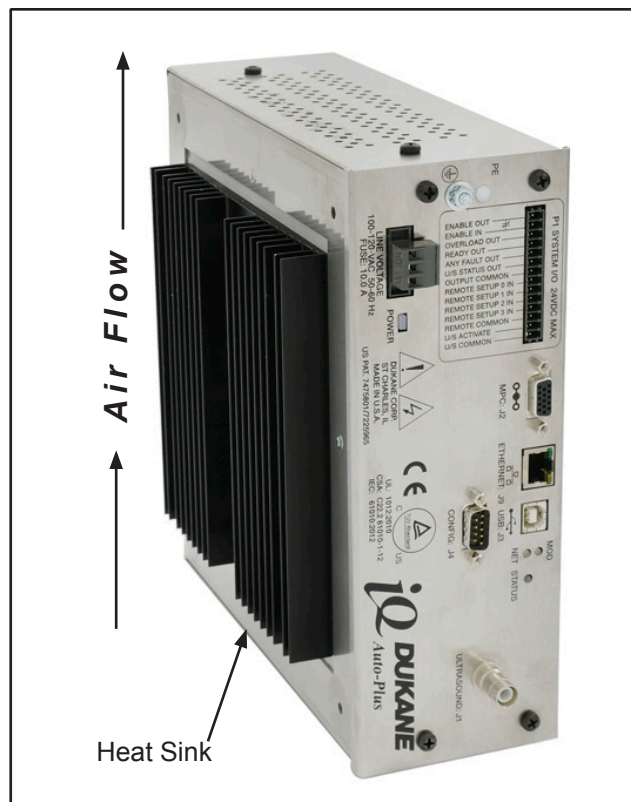


Figure 5-1 Generator with Heat Sink Option

Computer Interface

Provided with each *iQ* Auto Plus generator is a CD that contains the *iQ* Auto Plus Utility software. This software allows a Windows based computer to communicate with the generator using a USB port. This software provides the following features:

1. Set and view Amplitude, Free Run Frequency, and Frequency Limits
2. Configure and view network settings.
3. Restore factory defaults.
4. View generator alarms and I/O status
5. View the device ID.
6. Scan or test an ultrasonic stack.

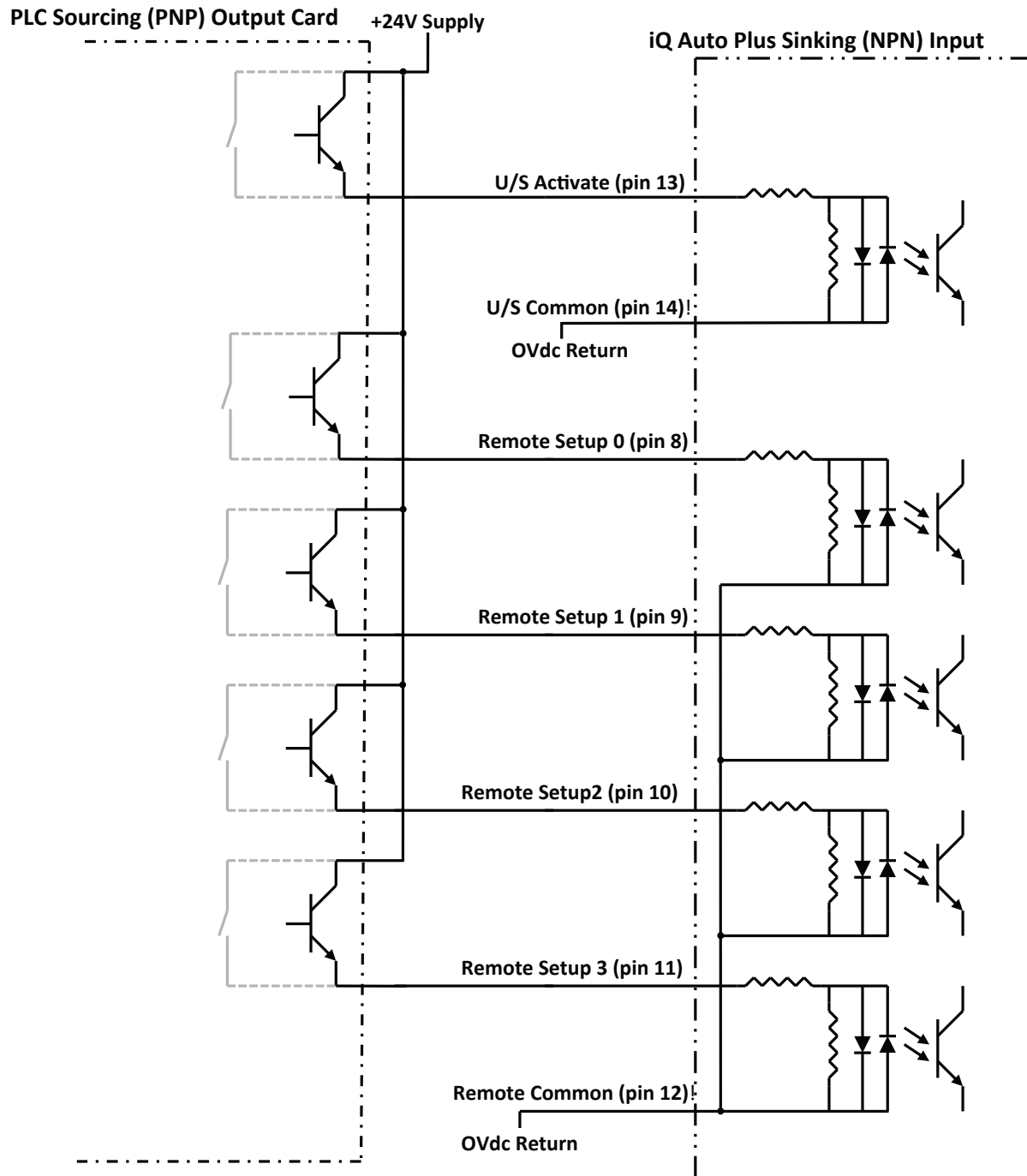
For more information on the computer interface, please refer to the *iQ* Auto Plus Utility Manual included on the CD.

SECTION 6

Automation Interface

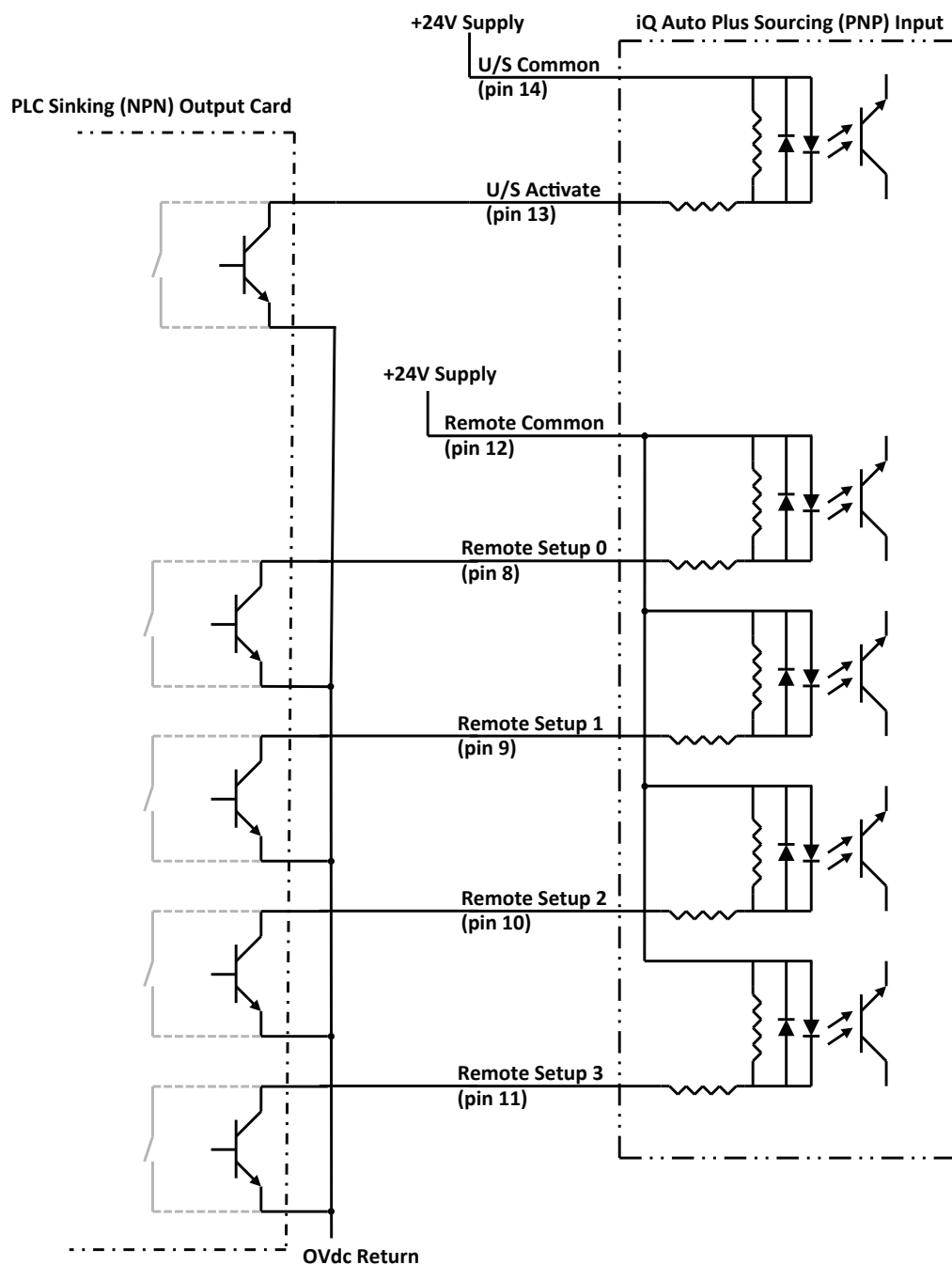
Input/Output Connection Examples	39
PLC Sourcing (PNP) Type Output Circuit	39
PLC Sinking (NPN) Type Output Circuit	40
PLC Sourcing (PNP) Type Input Circuit.	41
PLC Sinking (PNP) Type Input Circuit.	42
E-STOP Switch Diagram	43
Automation System Safety Circuit	43
<i>iQLinQ</i> [™]	44
<i>iQLinQ</i> Over RS-232 Interface Option	44
<i>iQLinQ</i> PROFIBUS Communications Module	45

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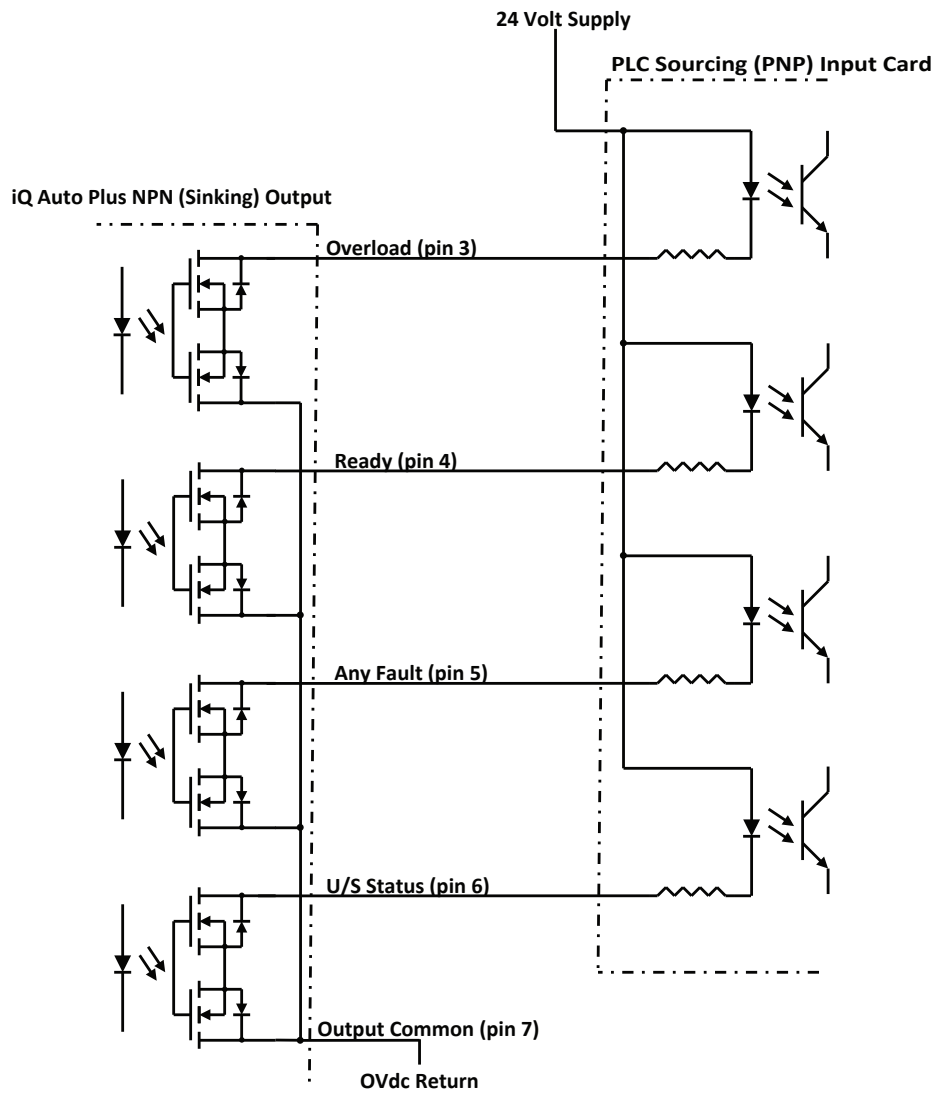
Input Voltage Range	DC 24V 10%
Input Current	10mA(typ) @ DC 24V input

Figure 6-1 PLC Sourcing (PNP) Type Output Circuit



Input Voltage Range	DC 24V 10%
Input Current	10mA(typ) @ DC 24V input

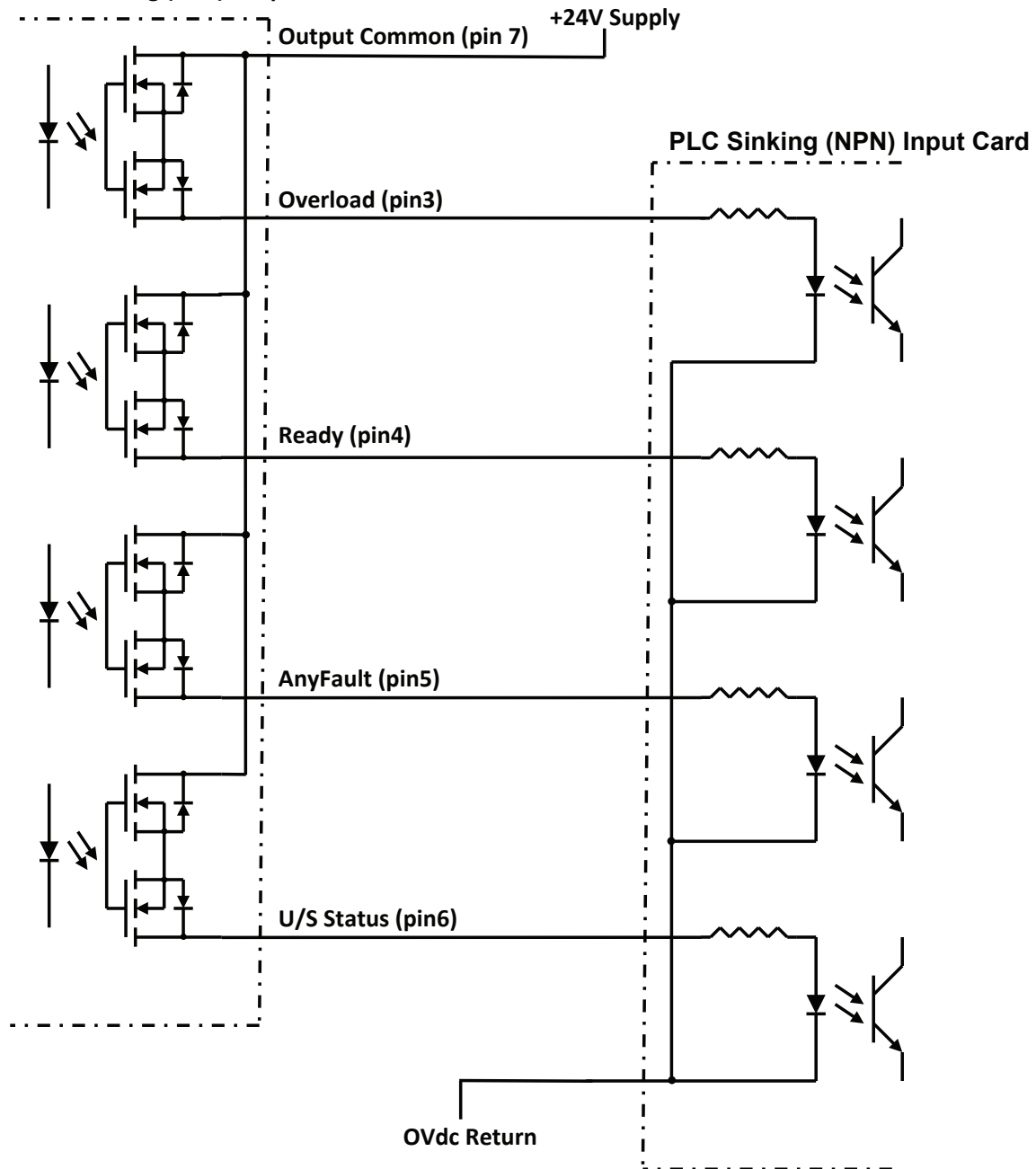
Figure 6-2 PLC Sinking (NPN) Type Output Circuit



Input Voltage Range	DC 24V 10%
Input Current	10mA(typ) @ DC 24V input
Output Driver	PHOTOMOS RELAY

Figure 6-3 PLC Sourcing (PNP) Type Input Circuit

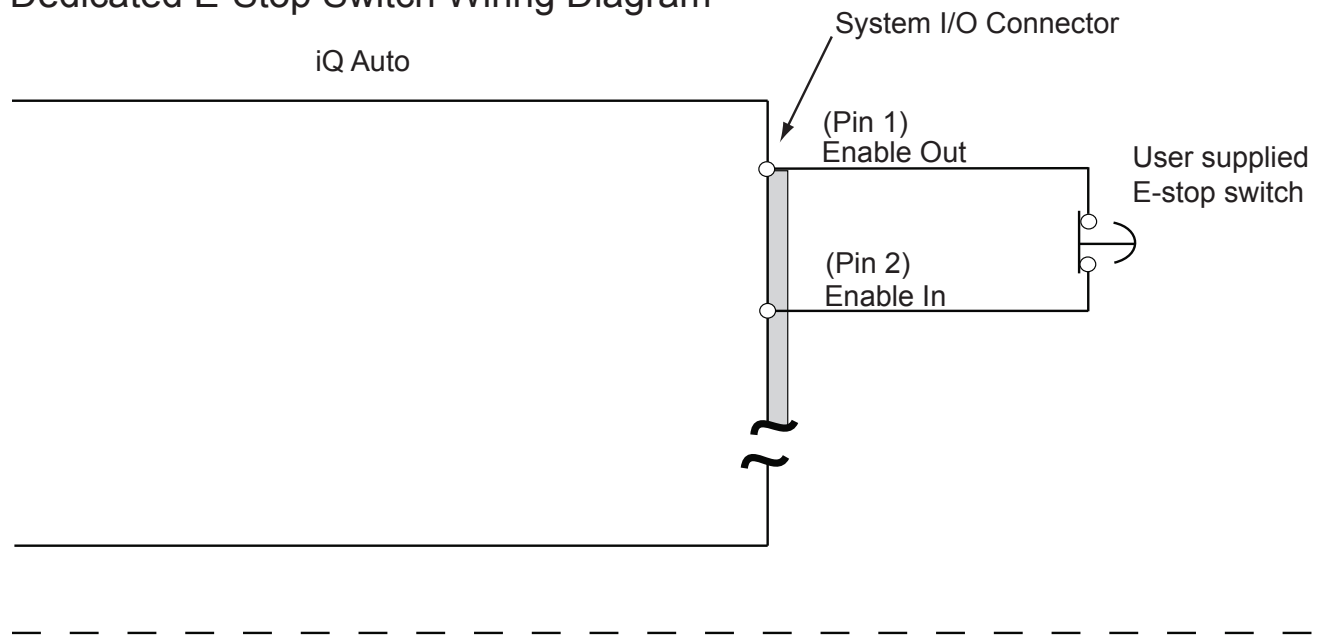
iQ Auto Plus Sourcing (PNP) Output



Input Voltage Range	DC 24V 10%
Input Current	10mA(typ) @ DC 24V input
Output Driver	PHOTOMOS RELAY

Figure 6-4 PLC Sinking (PNP) Type Input Circuit

Dedicated E-Stop Switch Wiring Diagram



Automation System Safety Circuit Wiring Diagram

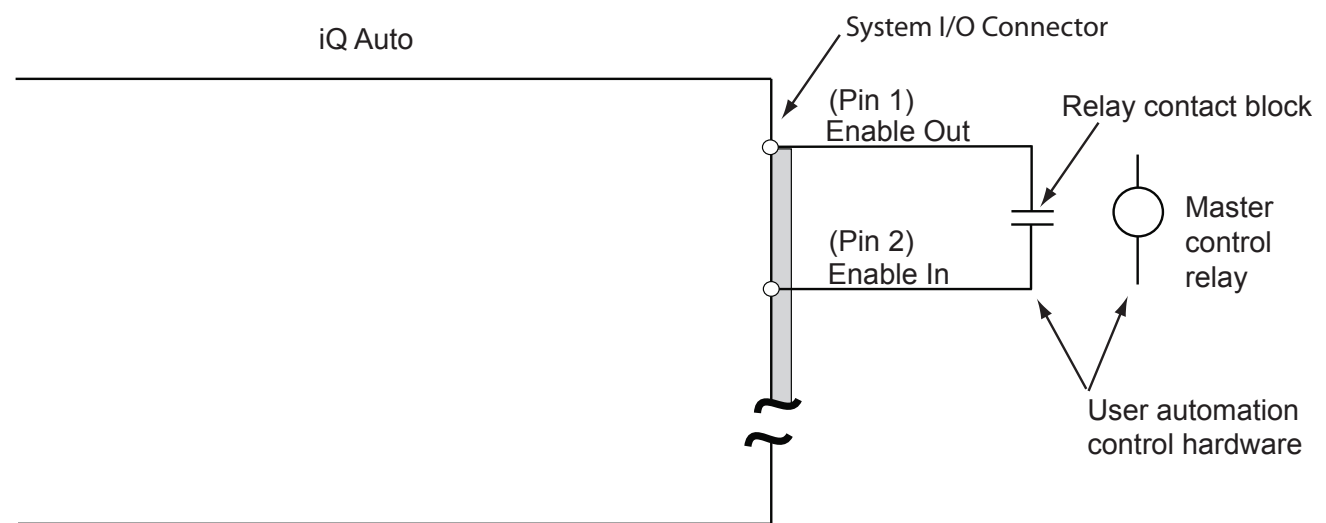


Figure 6-5 E-STOP Wiring and Automation System Safety Circuit



iQLinQ communication options allow automated systems to monitor and change settings in **iQ** generators. These options provide machine builders the ability to integrate the generator into an electrical cabinet and to use the machine's HMI to program or monitor weld settings.

All Dukane **iQ** Auto-Plus generators support **iQLinQ** communication, but the available features vary based on the model. The supported protocols are Ethernet I/P, Profibus, and **iQLinQ** over RS-232. **iQLinQ** provides a cost effective solution for adding the Weld by Energy feature that is only available in the more advanced **iQ** generators.

iQLinQ solutions are available to provide complete ladder logic and HMI screens that can be dropped into Allen Bradley (RSLogix 5000) and Siemens (Step 7) PLC projects. Contact your local Dukane representative for more information about the **iQLinQ** options.

iQLinQ over RS-232 Interface Option

The RS-232 Interface option allows the **iQ** generator to connect to a PLC's serial port. Each generator requires a dedicated connection to automation, so it is not possible to daisy-chain or bus multiple generators on a single RS-232 connection.

Control Parameters Available via RS-232

(M model)

1. Set these parameters: Amplitude, Ramp Up Time, and Ramp Down Time.
2. Configure advanced hardware settings including Phase, Free Run Frequency, Frequency Lock and Hold, and Frequency Limits.

Parameters that can be Obtained via RS-232

(M model)

1. All control parameters that are configured via RS-232.
2. Real time data that includes welder state (ultrasound active or not), frequency, power, and amplitude.

Control Parameters Available via RS-232

(S model)

1. Set weld method to Time, Energy, or Peak Power. set associated values in seconds, joules, or watts.
2. Set Amplitude, Ramp Up Time, and Ramp Down Time.
3. Enable and set Trigger by Power parameters.
4. Enable and set Hold Time.
5. Enable and set Afterburst delay and duration.
6. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power and/or Energy.
7. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power and/or Energy.
8. Configure advanced hardware settings including Phase, Free Run Frequency, Frequency Lock and Hold, and Frequency Limits.

Parameters that can be Obtained via RS-232

(S model)

1. All control parameters that are configured via RS-232.
2. Real time data that includes welder state (ultrasound active or not), frequency, power, and amplitude.
3. Weld cycle data from previous weld that includes:
 - Cycle Count
 - Good, Bad, and Suspect Part information
 - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
 - Weld Time
 - Weld Energy
 - Peak Power

For information on how to control and/or monitor specific parameters, **iQ** Generator RS-232 Communication and Control documentation is available.

Signing a non-disclosure agreement is required to obtain this documentation.

***iQLinQ*[™] PROFIBUS Communications Module**

Part Number - 110-4681

The PROFIBUS to *iQLinQ* converter allows the *iQ* generator to connect to a PROFIBUS network. Since PROFIBUS is multipoint instead of point-to-point, more than one generator can be connected to a single bus cable. The PROFIBUS to *iQLinQ* converter offers access to generator parameter settings and status information listed below. In addition, if desired, all I/O wiring can be replaced with a single PROFIBUS cable.

Control Parameters Available via PROFIBUS

1. Set weld method to Time, Energy, or Peak Power. Set associated values in seconds, joules, or watts.
2. Set Amplitude, Ramp Up Time, and Ramp Down Time.
3. Enable and set Trigger by Power parameters.
4. Enable and set Hold Time.
5. Enable and set Afterburst delay and duration.
6. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power and/or Energy.
7. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power and/or Energy.
8. Configure advanced hardware settings including Phase, Free Run Frequency, Frequency Lock and Hold, and Frequency limits.

Parameters Available via PROFIBUS

1. All parameters that are configured via PROFIBUS
2. Real time data which includes welder state (ultrasound active or not), frequency, power, and amplitude.
3. Weld cycle data from previous weld which includes:
 - Cycle Count
 - Good, Bad, and Suspect Part information
 - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
 - Weld Time
 - Weld Energy (Time and Energy option)
 - Peak Power

For information on how to control and/or monitor specific parameters, *iQ* Generator PROFIBUS Communication and Control documentation is available.

Signing a non-disclosure agreement is required to obtain this documentation.

EtherNet I/P Communications

All *iQ* Auto Plus generators have an Ethernet connector, that can be used for Ethernet I/P communication, but Ethernet I/P is only supported by the F Model.

Control Parameters Available via EtherNet/IP

1. Set weld method to Time, Energy, or Peak Power. Set associated value in seconds, joules, or watts.
2. Set Amplitude, Ramp Up Time, and Ramp Down Time.
3. Enable and set Trigger by Power parameters.
4. Enable and set Hold time.
5. Enable and set Afterburst delay and duration.
6. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power and/or Energy.
7. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power and/or Energy.
8. Configure advanced hardware settings including Free Run Frequency, Frequency Lock and Hold, and Frequency limits.

Parameters Available via Ethernet/IP

1. All parameters that are configured via EtherNet/IP.
2. Real time data which includes welder state (ultrasound active or not), frequency, power, and amplitude.
3. Weld cycle data from previous weld which includes:
 - Cycle Count
 - Good, Bad, and Suspect Part information
 - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
 - Weld Time
 - Weld Energy
 - Peak Power
 - Faults

For information on how to control and/or monitor specific parameters *iQ* Generator EtherNet/IP Communication and Control documentation is available. Contact your local sales representative for more information.

SECTION 7

Contacting Dukane

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Contacting Dukane

Identify Equipment

When contacting Dukane about a service-related problem, be prepared to give the following information:

- Model number, line voltage and serial number.
- Fault status.
- Problem description and steps taken to resolve it.

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane Ultrasonics
2900 Dukane Drive
St. Charles, IL 60174 USA

Phone: (630) 797-4900

E-mail: ussales@dukane.com

Fax:

Main (630) 797-4949

Service & Parts (630) 584-0796

Website

The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature.

Here is the address for the main website:

www.dukane.com/us/

You can locate your local representative at:

www.dukane.com/us/sales/intsales.htm

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SECTION 8

Specifications

Generator Outline Drawing	53
Weight	54
Operating Environment.	54
AC Power Requirements	55
Ultrasonic Pressure	56
Interpreting the Model Number.	57
<i>iQ</i> Auto to <i>iQ</i> Auto Plus Inputs/Outputs Comparison	58
Regulatory Agency Compliance	59

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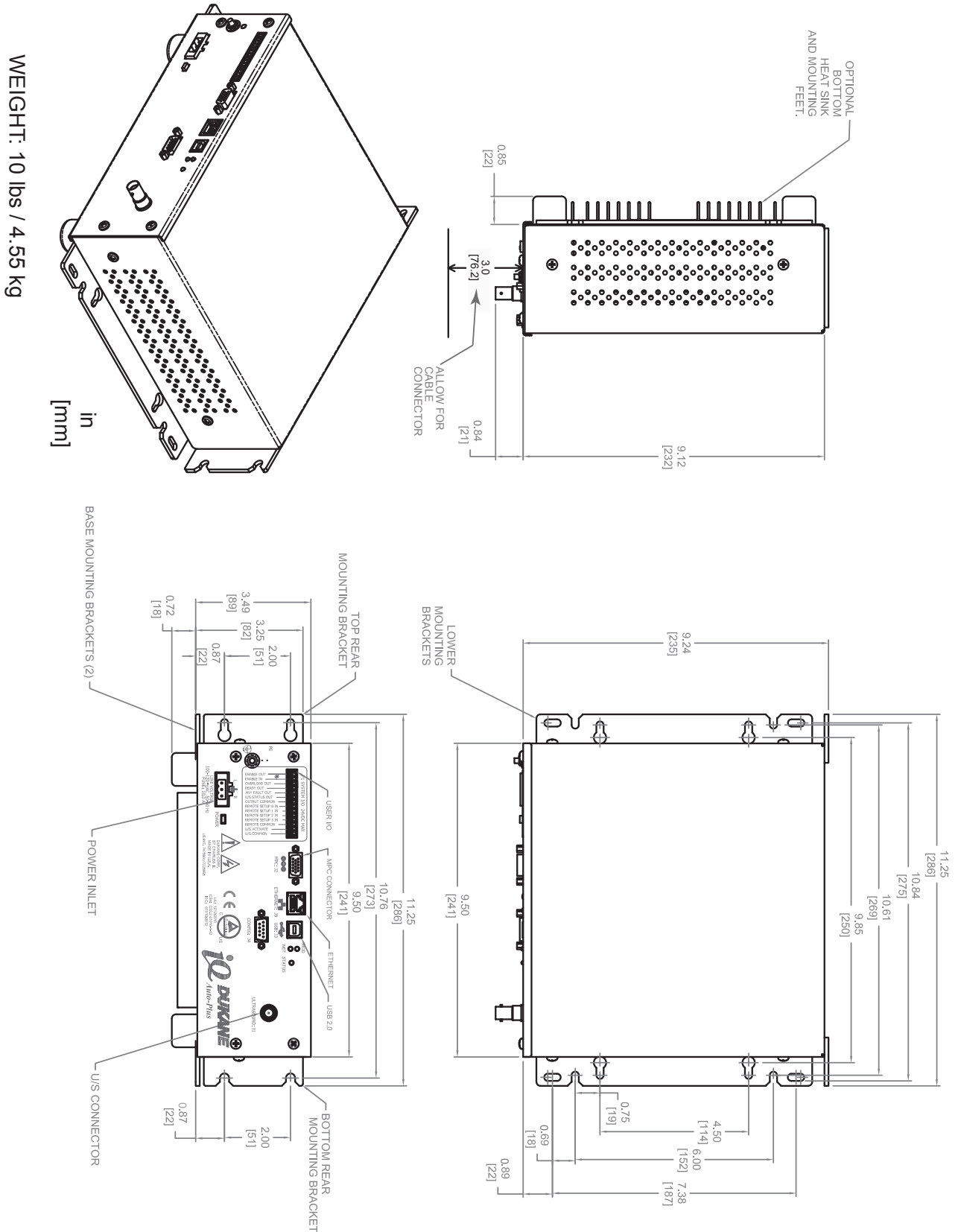


Figure 8-1 Generator Outline Drawing

Weight

Standard Model: 10 pounds (4.54 kg)

Shipping: Add 5 pounds (2.3 kg) to unit weight for packing materials.

Operating Environment

Operate the generator within these guidelines:

Temperature: 40°F to 100°F (+5°C to +38°C)

Air Particulates: Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

Humidity: 5% to 95% non-condensing @ +5°C to +30°C

Nonoperating storage guidelines:

Temperature: -4°F to 158°F (-20°C to +70°C)

Air Particulates: Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

Humidity: 5% to 95% non-condensing @ 0°C to +30°C

AC Power Requirements

Operating Frequency	Generator Model Number	Overload Power Ratings (Watts)	Input AC Power Requirements Nominal AC Volt @ Maximum RMS Current	North America/ Japan AC Outlet Rating
20kHz	20AT060-1X-XX	600	100-120V 50/60 Hz @ 15 Amps	15 Amps
20kHz	20AT060-2X-XX	600	200-240V 50/60 Hz @ 6.3 Amps	
20kHz	20AT075-2X-XX	750	200-240V 50/60 Hz @ 6.3 Amps	
30kHz	30AT060-1X-XX	600	100-120V 50/60 Hz @ 15 Amps	
30kHz	30AT060-2X-XX	600	200-240V 50/60 Hz @ 6.3 Amps	
30kHz	30AT075-2X-XX	750	200-240V 50/60 Hz @ 6.3 Amps	
40kHz	40AT060-1X-XX	600	100-120V 50/60 Hz @ 15 Amps	
40kHz	40AT060-2X-XX	600	200-240V 50/60 Hz @ 6.3 Amps	

Table 8-I AC Power Requirements

Ultrasonic Pressure

Ultrasonic Pressure					
<i>iQ</i> Generator Models - kHz	15	20	30	40	50
Useful Beam	360 degrees				
Ultrasonic Pressure @ Operator's Position - dB	125	140	130	130	130
Ultrasonic Pressure 1 m from the Equipment- dB	110	130	110	105	110

Table 8-II *iQ* Generator Ultrasonic Pressure

NOTE

All measurements taken with Data Physics Dynamic 4-Channel Signal Analyzer with calibrated 377C01 Microphone and 426B02 Preamplifier.

Interpreting the Model Number

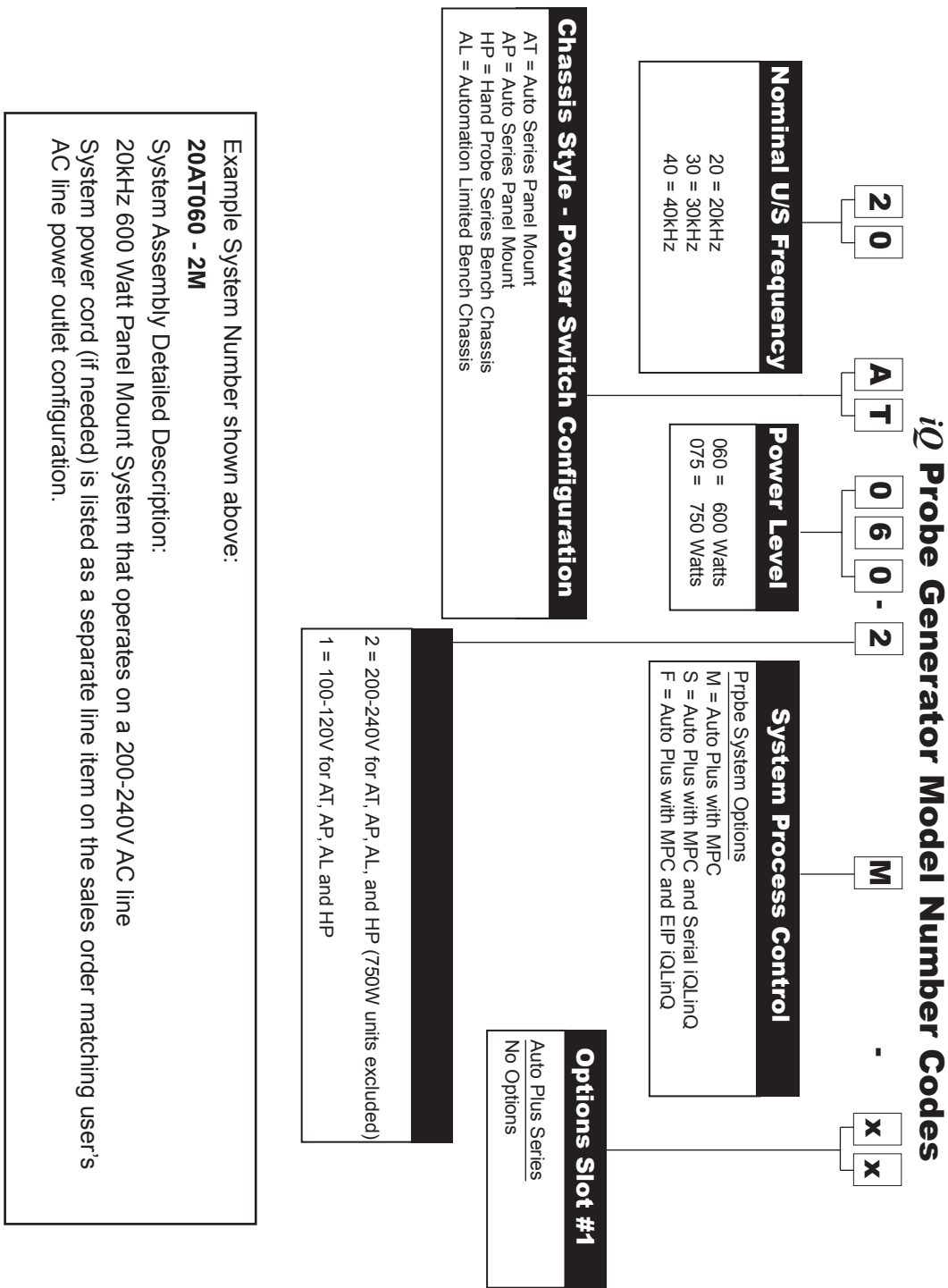


Figure 8-2 Interpreting the Model Number

iQ Auto to iQ Auto Plus - Inputs/Outputs Comparison

iQ Auto		iQ Auto Plus		iQ Auto Plus Difference
System I/O Connector		P1 System I/O Connector		
Pin	Signal Name	Pin	Signal Name	
1	Enable Out	1	Enable Out	No difference.
2	Enable In	2	Enable In	No difference.
3	Overload Out	3	Overload Out	No difference.
4	U/S Status Out	6	U/S Status Out	Same function, but moved to Pin 6.
5	Any Fault Out	5	Any Fault Out	No difference.
6	Power OK Out			Removed.
7	Output Common (non-isolated)	7	Output Common (isolated)	Isolated common - allows NPN or PNP input operation.
8	Spare Status Out			Removed.
9	Analog Power Out+			Removed.
10	Analog Power Out-			Removed.
11	Fault Reset Input			Removed. (Faults automatically reset at beginning of the next cycle.)
12	U/S Activate Input	13	U/S Activate	Same function, but moved to Pin 13.
13	Input Common (isolated)	14	U/S Common (isolated)	Common for U/S Activate only. Provides higher level of safety.
MPC I/O Connector				
1	Setup Bit 0 Input	8	Remote Setup Bit 0 Input	Same function, but moved to single I/O connector.
2	Setup Bit 1 Input	9	Remote Setup Bit 1 Input	Same function, but moved to single I/O connector.
3	Setup Bit 2 Input	10	Remote Setup Bit 2 Input	Same function, but moved to single I/O connector.
4	Setup Bit 3 Input	11	Remote Setup Bit 3 Input	Same function, but moved to single I/O connector.
5	Input Common (isolated)	12	Remote Common (isolated)	Common for Remote Setup bits only. Not tied to any other common.
6	MPC Ready Out	4	Ready Out	MPC Ready Output is incorporated into the System Ready signal.
7	Output Common			Combined into P1 System I/O Connector.

Table 8-III iQ Auto to iQ Auto Plus Inputs/Outputs Comparison

Regulatory Agency Compliance

FCC

The generator complies with the following Federal Communications Commission regulations.

- The limits for FCC measurement procedure MP-5, “Methods of Measurement of Radio Noise Emissions from ISM Equipment”, pursuant to FCC Title 47 Part 18 for Ultrasonic Equipment.

CE Marking

This mark on your equipment certifies that it meets the requirements of the EU (European Union) concerning interference causing equipment regulations. CE stands for Conformité Européenne (European Conformity). The equipment complies with the following CE requirements.

- The EMC Directive 2004/108/EC for Heavy Industrial —
EN 61000-6-4: 2001
EN 55011: 2003
EN 61000-6-2: 2005
EN61000-4-2
EN61000-4-3
EN61000-4-4
EN61000-4-5
EN61000-4-6
EN61000-4-8
EN61000-4-11
- The Low Voltage Directive 2006/95/EC.
- The Machinery Directive 2006/42/EC.
EN 60204: 2006
Safety of Machinery - Electrical Equipment of Machines Part 1: General Requirements.

IP Rating

The *iQ* generator has an IP (International Protection) rating from the IEC (International Electrotechnical Commission).

The rating is IP2X, in compliance with finger-safe industry standards.

UL

The *iQ* generator complies with these standards:

Underwriters Laboratories:

UL 1012: 2010

UL 61010-1:2012, and

National Standards of Canada:

CAN/CSA C22.2 No. 61010-1-12:2012

as verified by TÜV Rheinland.



CAUTION

DO NOT make any modifications to the generator or associated cables as the changes may result in violating one or more regulations under which this equipment is manufactured.

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SECTION 9

Appendices

Appendix A, List of Figures. 63

Appendix B, List of Tables 64

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Appendix A

List of Figures

No.	Description	Page
1-1	Thermal and Power Considerations for iQ Auto Generators	5
2-1	AC Line Connection	11
3-1	Mounting Brackets - Rear and Bottom	15
3-2	Generator Front View	17
3-3	MPC Interface Connector	20
3-4	MPC Module Cutout Guide	22
3-5	MPC Module Rear Connectors	23
3-6	MPC Module Front Connectors	23
3-7	MPC Module Status LEDs.....	24
4-1	Generator POWER LED Detail	28
4-2	LED Locations	31
5-1	Generator with Heat Sink Option.....	35
6-1	PLC Sourcing (PNP) Type Output Circuit.....	39
6-2	PLC Sinking (NPN) Type Output Circuit.....	40
6-3	PLC Sourcing (PNP) Type Input Circuit.....	41
6-4	PLC Sinking (PNP) Type Input Circuit.....	42
6-5	E-STOP Wiring and Automation System Safety Circuit.....	43
8-1	Generator Outline Drawing.....	53
8-2	Interpreting the Model Number.....	57

Appendix B

List of Tables

No.	Description	Page
3-I	P1 System I/O Connector Signals	18
3-II	System I/O Remote Setup Inputs	21
3-III	Probe Cables	23
4-I	LED Colors and Indication	32
8-I	AC Power Requirements	55
8-II	iQ Generator Ultrasonic Pressure	56
8-III	iQ Auto to iQ Auto Plus Inputs/Outputs Comparison.....	58

Index

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Index

A

Agency Compliance 59
 CE Marking 59
 FCC 59
 IP (International Protection) Rating 59
Appendices 61
 List of Figures 63
 List of Tables 64
Appendix A - List of Figures 63
Appendix B - List of Tables 64
Automation Interface 37

C

Chassis Grounding Stud 16
Computer Interface 36
Connecting Cables 17

D

Dukane
 Email 49
 Phone 49
 Service and Parts 49
 www.dukane.com/us/ 49

E

Electrical Safety
 Power Grounding Connection 11
EtherNet I/P Communications 46

F

FCC 59

G

General User Information 3
 Drawings and Tables 3
 Notes, Cautions and Warnings 3
 Read This Manual First 3
Generator
 Features 4
 Overview 4
 Thermal Considerations 5

H

Health and Safety
 Electrical Safety 10
 General Considerations 9
 Plastics Health Notice 10
 Recommendations 9
Heat Sink 35

I

Installation
 Connecting Cables 17
 Optional MPC Interface Connections 20
 P1 System I/O Connector Pinout 18
 MPC Module Installation Guide 22
 Placement 15
 Placement in a Seismic Region 15
 Power Grounding 16
 Unpacking 15
Interpreting the Model Number 57, 58
IP (International Protection) Rating 59
iQ Auto to iQ Auto Plus - Inputs/Outputs Comparison 58
iQLinQ 44
 iQLinQ over RS-232 Interface Option 44
 iQLinQ PROFIBUS Communications Module 45

M

MPC Module Installation Guide 22

MPC Module Status LEDs 24

MPC Probe Control 21

Multi-Probe Control (MPC) 20

N

Notes, Cautions and Warnings 3

O

Options

Computer Interface 36

Heat Sink 35

P

P1 System I/O Connector Pinout 18

R

Regulatory Agency Compliance 59

S

Specifications

AC Power Requirements 55

Interpreting the Model Number 57, 58

iQ Auto to iQ Auto Plus - Inputs/Outputs Comparison 58

Operating Environment 54

Ultrasonic Pressure 56

Weight 54

System Operation

Introduction 27

iQ Auto-Plus System Operational Test 28

LED Indication 31

T

Thermal Considerations 5

Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 9001 certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well-defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane's status as a quality vendor of technology and products.

To achieve ISO 9001 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement
3. Quality in Line Organizations and Quality System Infrastructure.

The ISO 9001 standard establishes a minimum requirement for these requirements and starts transitioning the company from a traditional inspection-oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane's quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.

**ISO 9001
CERTIFIED**

Dukane products are manufactured in ISO registered facilities.

View the Dukane ISO certificate of compliance at: <http://www.dukane.com/ISORegistrationCertificate.pdf>

Please refer to our website at:
www.dukane.com/us/sales/intsales.htm
to locate your local representative.

iQ Series, Ultrasonic Generator/Power Supply
Auto-Plus User's Manual
Part No. 403-591-00



www.dukane.com/us

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